

Case Design Guidelines for Apple Devices

Release R3

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General Case Design Guidelines

The guidelines in this chapter apply to all Apple devices.

Mechanical Considerations

A well-designed case will securely house an Apple device while not interfering with the device's operation. Significant factors in mechanical design include access to the device's sensors, controls, and connectors.

Device Layouts and Dimensions

Cases should be designed to accommodate the full range of Apple device sizes within each product's dimensional variation. Dimensional drawings with tolerances can be downloaded from developer.apple.com/resources/cases/. The locations of the sensors, controls, and connectors for the iPhone 5 and iPod touch (5th generation) are shown in [Figure 1-1](#) (page 5), and for the iPad (3rd generation) in [Figure 1-2](#) (page 5).

Figure 1-1 iPhone 5 and iPod touch (5th generation) sensors, controls, and connectors

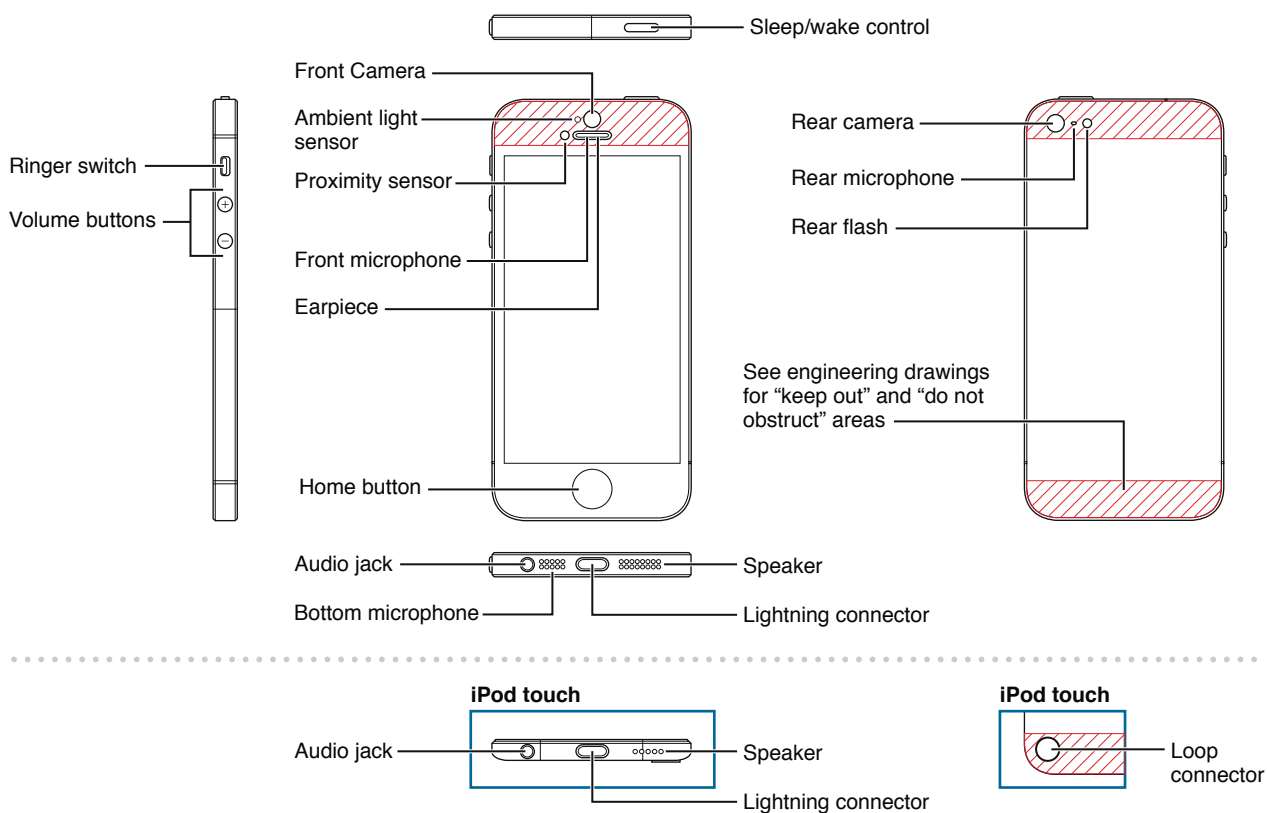
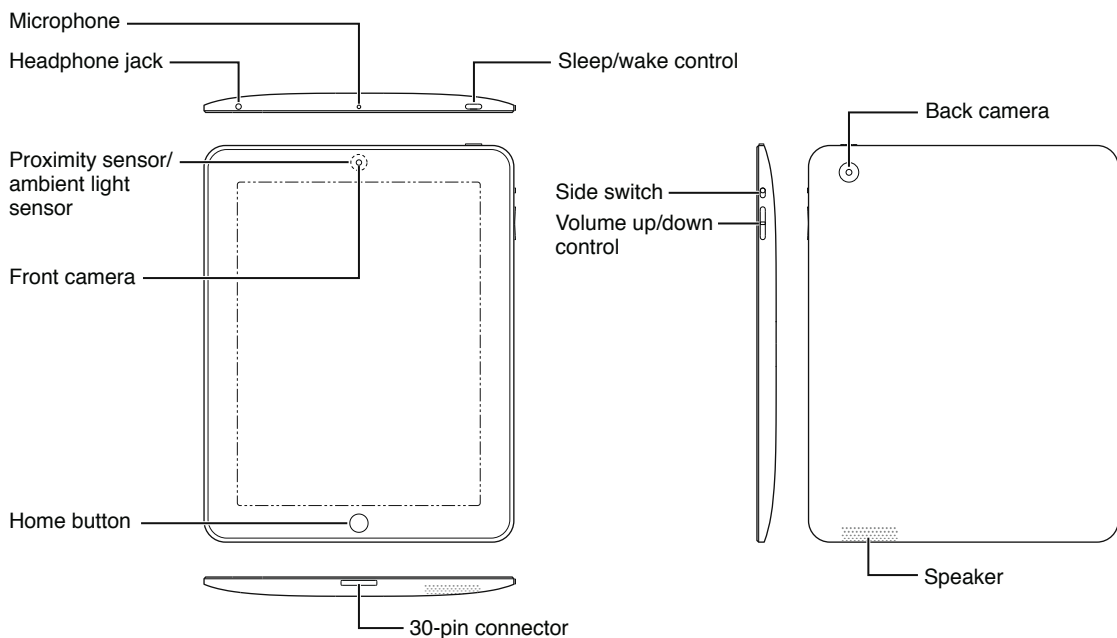


Figure 1-2 iPad (3rd generation) sensors, controls, and connectors



Access to Controls

The case should readily permit the user to access and manipulate the device's mechanical controls, including volume and ring/silent controls, sleep/wake control, and the home button.

Access to the Audio Jack and 30-pin or Lightning Connector

The case should provide ready access to the audio jack. The case should be tested with a range of headphones, including studio monitor types that have large plugs.

The case should also provide unobstructed access to either the 30-pin connector or the Lightning connector. Some accessories, such as factory-installed automotive sound systems, have cables with large connector housings.

In addition, the audio jack and 30-pin or Lightning connector openings should be designed with enough margin to compensate for shifting or dimensional changes of the case material.

Acoustical Considerations

The case should not impair or degrade the acoustical performance of an Apple device.

Speaker and Microphone Openings

When Apple devices have speakers or microphones, their locations may vary from model to model. Refer to the dimensional drawings for various Apple devices cited in "[Device Layouts and Dimensions](#)" (page 4). The case should not obstruct the speaker or microphone ports.

Speaker to Microphone Coupling

The case should not facilitate the conduction of sound from the speaker to any microphone. Such sound conduction can cause echoing in phone calls.

Call Quality

The case should not impair or degrade the user's experience making and receiving both audio calls over a cellular network or video calls using Apple's FaceTime software. User testing should be conducted in handset, speakerphone, and headset modes of operation, to confirm that the case does not change the loudness or frequency response of the speakers or microphones. In addition, the user should not be able to detect any sound distortion resulting from enclosing the Apple device in the case.

Sensor Considerations

Various Apple devices contain several environmental sensors, including an ambient light sensor, a magnetic compass, a proximity sensor, an accelerometer, and a three-axis gyroscope. Cases should be designed so they do not interfere with the operation of these sensors.

Ambient Light and Proximity Sensor Interference

The ambient light and proximity sensor locations for various Apple devices are shown in the dimensional drawings cited in "[Device Layouts and Dimensions](#)" (page 4). Some of the dimensional drawings specify a recommended keepout area around these sensors. No material should be allowed to cover either these sensors or their keepout areas.

Magnetic Interference

Case designs for Apple devices should avoid the use of magnets (for example, as closure devices) and magnetic materials. Cases with parts made of any metal should be tested to verify that they do not affect an Apple device's built-in magnetic compass, if any.

Besides their effect on a built-in magnetic compass, magnets in cases can affect other sensors and electronic components. Cases should not include magnets unless there is no other practical design solution and only if they do not affect the operation of the Apple device in any way.

Camera Considerations

Pictures taken by the device's built-in camera when the device is in the case should appear identical to those taken without the case. This applies also to pictures taken using a built-in LED flash, if one is present. This section describes some common picture differences that may occur. The camera test image used here can be downloaded from developer.apple.com/resources/cases/.

Lens and Flash Occlusion

Various Apple devices have camera lenses on the back and/or the front. Some of the dimensional drawings cited in "[Device Layouts and Dimensions](#)" (page 4) specify a recommended keepout area around these lenses. No material should be allowed to cover any lenses or their keepout areas. The case openings for lenses should also be large enough to eliminate any of the image degradation problems described below.

Some devices feature an LED flash to illuminate picture taking. The case should not cover or obstruct the flash with any material.

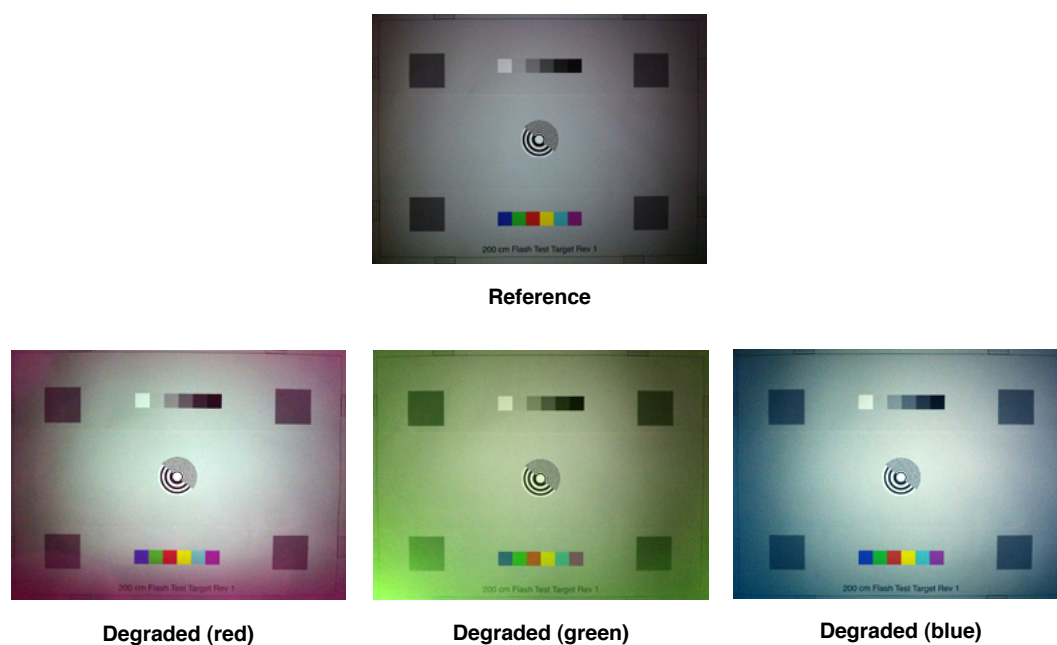
Image Degradation

A case that encroaches too closely on the perimeter of any camera lens may produce image degradation, even without obstructing the lens. The case should not cause contrast decrease, color shift, image blocking, or flash interference through any camera lens.

Color Shift

If the material of a colored case encroaches too closely on a camera lens or LED flash, it may impart a color shift to the picture. This effect for various colors is illustrated in Figure 1-4.

Figure 1-3 Image degradation by color shifting



Note A matte black ring around the interior of the lens opening of a case can reduce the incidence and/or severity of color shift.

Contrast Decrease

If the case opening is too close to a camera lens, it may decrease the contrast of pictures taken through that lens, as illustrated in Figure 1-3.

Figure 1-4 Image degradation by decrease of contrast

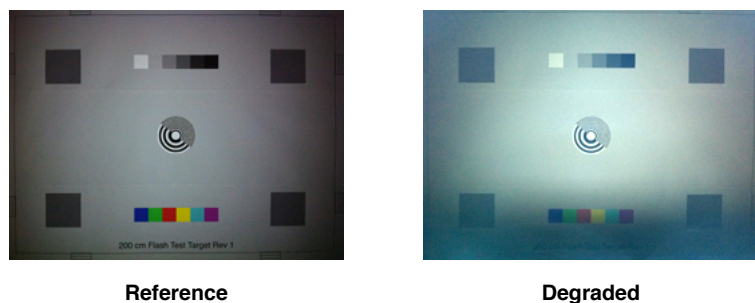
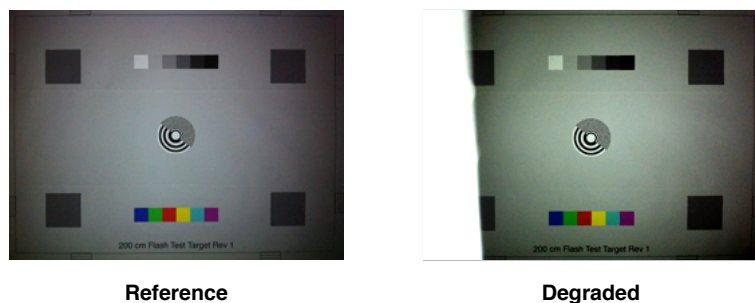


Image Blocking

If a camera opening in a case is too close to a lens, it may block part of the image, as illustrated in Figure 1-5.

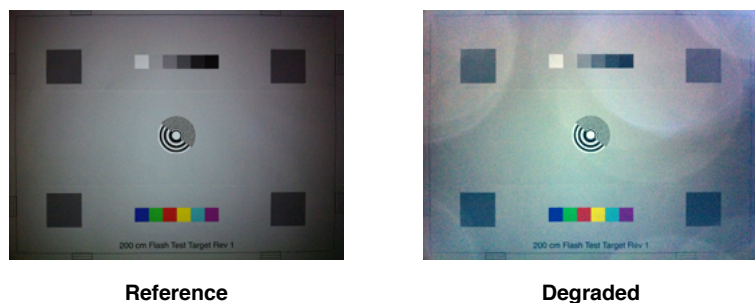
Figure 1-5 Image degradation by blocking



Flash Interference

The case should not reflect any light from the LED flash into its camera lens. Doing so produces the effect illustrated in Figure 1-6.

Figure 1-6 Image degradation by flash interference



Reliability Testing

Cases for Apple devices should be tested to verify that they will withstand long-term use under typical use conditions, and that they do not impair or degrade the functionality of the device, damage it or its immediate surroundings, or adversely affect the user.

Device Insertion and Removal

The case should hold the Apple device securely while permitting its easy insertion and removal. The case and the enclosed device should not be damaged by the repeated insertion and removal of the device from the case under conditions representative of long-term use in a variety of environments.

Colorfastness

Any dyes, inks, or coatings in or on the case should not bleed color onto either the device or its user, particularly while the case is in contact with common substances such as water or sunscreen.

Environmental Substance Restrictions

Cases for Apple devices should comply with applicable environmental regulations in the regions in which such cases are to be sold, and any applicable substance or material restrictions, including applicable restrictions on the following substances:

- Lead (Pb)
- Cadmium (Cd)
- Mercury (Hg)
- Hexavalent Chromium (Cr(VI))
- Hexavalent Chromium (Cr(VI)) in leather
- Nickel (Ni) plating on user-accessible surfaces
- Azo-based dyes that release the aromatic amines specified in European Directive 2002/61/EC
- Natural rubber latex

RF Absorbing Materials

Cases for Apple devices should not contain materials or coatings that absorb radio frequency energy. Such materials can impair or degrade the performance of cellular communication antennas or GPS, WiFi, or Bluetooth antennas. Examples include (but are not limited to) the following:

- Metals (e.g. steel, aluminum, magnesium, titanium, etc.)

- Plastics with any carbon content

- Plastics with any glass content

- Plastics with metallic plating

- Metallic paints

- Black paints with high carbon loading

- White paints with high titanium dioxide loading

- Metallic Physical Vapor Deposition (PVD) coatings

Touchscreen Overlays

The touch interface in an Apple device senses the presence of one or more fingers on its surface. Any material between the surface and the user's hand, even a very thin sheet of plastic, can affect the performance of the touch interface. If a case design requires a touchscreen to be overlaid with another material, the material should be thinner than 0.3 mm and should be designed so that there are no air gaps between it and the touchscreen surface. Such an overlay should not be electrically conductive.

Document Revision History

This table describes the changes to *Case Design Guidelines for Apple Devices*.

Date	Notes
2012-09-12	<i>Revision R3:</i> Added information for devices with the Apple Lightning™ connector: iPhone 5, iPod touch (5th generation), and iPod nano (7th generation).
2011-03-11	<i>Revision R2:</i> Updated guidelines to cover cases for iPads. Changed document title from “iPhone Case Design Guidelines” to “Case Design Guidelines for Apple Devices.”
2011-02-28	<i>Revision R1:</i> First release of “iPhone Case Design Guidelines.”



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